ATTRACTED MATTER DETECTING DEVICE ATTRACTED MATER DETECTING METHOD USING THE SAME, DISLOCATION DETECTING METHOD USING THE DEVICE AND CLEANING METHOD USING THE DEVICE

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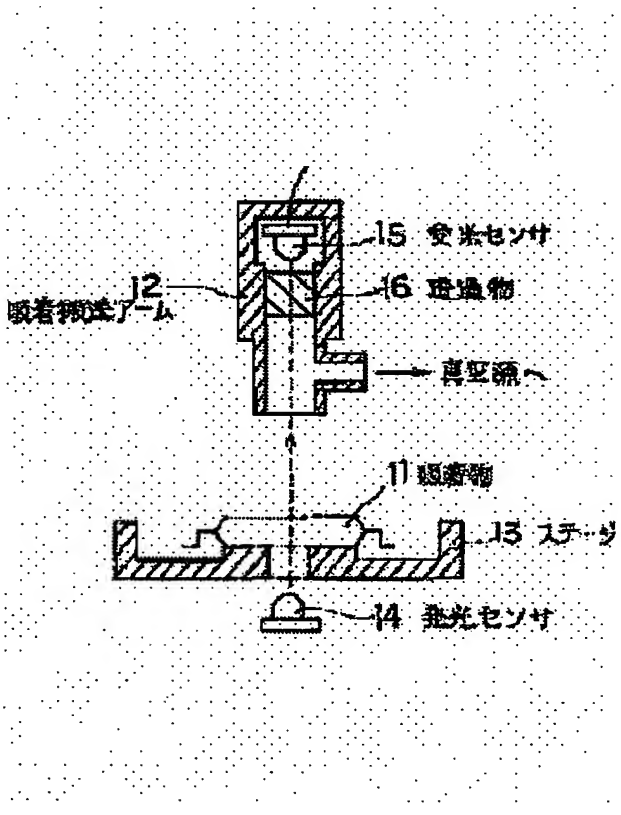
Abstract of **JP10068759**

PROBLEM TO BE SOLVED: To provide an attracted matter detecting device and the like which has improved throughput and which can detect the presence and absence of the attracted matter securely and which can save the space and constitution of which is simple. SOLUTION: This device has an attractive carrier arm 12 for vacuum attracting an attracted matter 11 by a nozzle hole and carrying it in horizontal and vertical directions. An upward light emission sensor 14 is arranged at the rear side of a part of a stage 13 on which the attracted matter 11 is placed. Such a through hole that upward beam of the light emission sensor 14 is not blocked is opened in the part on which the attracted matter 11 is placed. While, a downward light receiving sensor 15 for receiving a beam from the light emission sensor 14 is arranged in an inner part of the nozzle hole of the attractive carrier arm 12.



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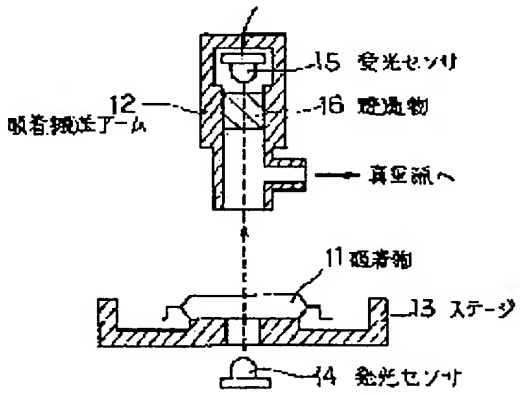
(54) ATTRACTED MATTER DETECTING DEVICE ATTRACTED MATER DETECTING METHOD USING THE SAME, DISLOCATION DETECTING METHOD USING THE DEVICE AND CLEANING METHOD USING THE DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an attracted matter detecting device and the like which has improved throughput and which can detect the presence and absence of the attracted matter securely and which can save the space and constitution of which is simple.
SOLUTION: This device has an attractive carrier arm 12 for vacuum attracting an attracted matter 11 by a nozzle hole and carrying it in horizontal and vertical directions. An upward light emission sensor 14 is arranged at the rear side of a part of a stage 13 on which the attracted matter 11 is placed. Such a through hole that upward beam of the light emission sensor 14 is not blocked is opened in the part on which the attracted matter 11 is placed. While, a downward light receiving sensor 15 for receiving a beam from the light emission sensor 14 is arranged in an inner part of the nozzle hole of the attractive carrier arm 12.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] It is adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing. The nozzle hole which leads to the source of a vacuum or the source of negative pressure while carrying out opening to said adsorption conveyance arm toward said stage side is formed. A light emitting device is arranged at the background of said predetermined location, or either of said adsorption conveyance arms. A through hole which does not interrupt the beam of light from said light emitting device is prepared in said predetermined location. Adsorbate detection equipment characterized by arranging the photo detector for receiving the beam of light from said light emitting device on said background of a predetermined location where said light emitting device is not arranged, or said adsorption conveyance arm.
[Claim 2] It is adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing. The nozzle hole which leads to the source of a vacuum or the source of negative pressure while carrying out opening to said adsorption conveyance arm toward said stage side is formed. A light emitting device is arranged at either in the inner part of the background of said predetermined location, or the nozzle hole of said adsorption conveyance arm. A through hole which does not interrupt the beam of light from said light emitting device is prepared in said predetermined location. Adsorbate detection equipment characterized by arranging the photo detector for receiving the beam of light from said light emitting device in the inner part of the background of said predetermined location where said light emitting device is not arranged, or the nozzle hole of said adsorption conveyance arm.
[Claim 3] Adsorbate detection equipment according to claim 2 with which the upper part of said adsorption conveyance arm containing the light emitting device or photo detector arranged in the inner part of said nozzle hole became the sensor unit which became independent of said adsorption conveyance arm through the optical fiber.
[Claim 4] It is adsorbate detection equipment according to claim 2 said whose adsorption conveyance arm this sensor unit is fixed to the location which faces said predetermined location by the upper part of said adsorption conveyance arm containing the light emitting device or photo detector arranged in the inner part of said nozzle hole having become the sensor unit which became independent of said adsorption conveyance arm, and is the structure where the beam of light from a light emitting device can be passed.
[Claim 5] The adsorbate detection approach which is the adsorbate detection approach by equipment according to claim 2, and is characterized by judging it as those with the adsorbate when said photo detector is not receiving light, and judging that he has no adsorbate when light is being received when moving said adsorption conveyance arm above said predetermined location.
[Claim 6] The adsorbate detection approach which moves said adsorption conveyance arm to said predetermined location the bottom, is made to carry out suction actuation, and is characterized by checking the existence of the adsorbate again with said pressure sensor after forming a pressure sensor all over vacuum Rhine from the nozzle hole of said adsorption conveyance arm to the source of a vacuum, or the source of negative pressure and judging it as those with the adsorbate by said photo detector in the adsorbate detection approach according to claim 5.
[Claim 7] In the condition that it is the approach of detecting a location gap of an adsorption conveyance arm using equipment according to claim 2, and there is no adsorbate in said predetermined location The location gap detection approach characterized by judging that the location of said adsorption conveyance

arm has shifted to said predetermined location when moving said adsorption conveyance arm above said predetermined location from a criteria location and said photo detector does not receive the beam of light from said light emitting device.
[Claim 8] After judging that the location of said adsorption conveyance arm has shifted to said predetermined location in the location gap detection approach according to claim 7, The horizontal migration of said adsorption conveyance arm is made to carry out in the direction of arbitration until said photo detector receives the beam of light from said light emitting device. The location gap detection approach characterized by amending the position coordinate when moving said adsorption conveyance arm above said predetermined location based on the position coordinate recognized by the migration means of said adsorption conveyance arm when said photo detector receives light.
[Claim 9] The cleaning approach which is the cleaning approach by equipment according to claim 2, supplies positive pressure Ayr to vacuum Rhine from the nozzle hole of said adsorption conveyance arm to the source of a vacuum, or the source of negative pressure, and is characterized by spraying Ayr from said nozzle hole towards said predetermined location.
[Claim 10] It is adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing. The nozzle hole which leads to the source of a vacuum or the source of negative pressure while carrying out opening to said adsorption conveyance arm toward said stage side is formed. A reflective object is arranged at either the front face of said predetermined location, or said adsorption conveyance arm. Adsorbate detection equipment characterized by arranging the photo detector for receiving the beam of light from a light emitting device and this light emitting device through said reflective object on said front face of a predetermined location where said reflective object is not arranged, or said adsorption conveyance arm.
[Claim 11] It is adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing. The nozzle hole which leads to the source of a vacuum or the source of negative pressure while carrying out opening to said adsorption conveyance arm toward said stage side is formed. A reflective object is arranged at either in the inner part of the front face of said predetermined location, or the nozzle hole of said adsorption conveyance arm. Adsorbate detection equipment characterized by arranging the photo detector for receiving the beam of light from a light emitting device and this light emitting device through said reflective object in the inner part of the front face of said predetermined location where said reflective object is not arranged, or the nozzle hole of said adsorption conveyance arm.
[Claim 12] Adsorbate detection equipment according to claim 11 with which the upper part of said adsorption conveyance arm containing the group of the reflective object or light emitting device arranged in the inner part of said nozzle hole, and a photo detector became the sensor unit which became independent of said adsorption conveyance arm through the optical fiber.
[Claim 13] It is adsorbate detection equipment according to claim 11 said whose adsorption conveyance arm this sensor unit is fixed to the location which faces said predetermined location by the upper part of said adsorption conveyance arm containing the group of the reflective object or light emitting device arranged in the inner part of said nozzle hole, and a photo detector having become the sensor unit which became independent of said adsorption conveyance arm, and is the structure where the beam of light from a light emitting device can be passed.
[Claim 14] The adsorbate detection approach which is the adsorbate detection approach by equipment according to claim 11, and is characterized by judging it as those with the adsorbate when said photo detector is not receiving light, and judging that he has no adsorbate when light is being received when moving said adsorption conveyance arm above said predetermined location.
[Claim 15] The adsorbate detection approach which moves said adsorption conveyance arm to said predetermined location the bottom, is made to carry out suction actuation, and is characterized by checking the existence of the adsorbate again with said pressure sensor after forming a pressure sensor all over vacuum Rhine from the nozzle hole of said adsorption conveyance arm to the source of a vacuum, or the source of negative pressure and judging it as those with the adsorbate by said photo detector in the adsorbate detection approach according to claim 14.
[Claim 16] In the condition that it is the approach of detecting a location gap of an adsorption conveyance arm using equipment according to claim 11, and there is no adsorbate in said predetermined location The location gap detection approach characterized by judging that the location of said adsorption conveyance

arm has shifted to said predetermined location when moving said adsorption conveyance arm above said predetermined location from a criteria location and said photo detector does not receive the beam of light from said light emitting device.
[Claim 17] After judging that the location of said adsorption conveyance arm has shifted to said predetermined location in the location gap detection approach according to claim 16, The horizontal migration of said adsorption conveyance arm is made to carry out in the direction of arbitration until said photo detector receives the beam of light from said light emitting device. The location gap detection approach characterized by amending the position coordinate when moving said adsorption conveyance arm above said predetermined location based on the position coordinate recognized by the migration means of said adsorption conveyance arm when said photo detector receives light.
[Claim 18] The cleaning approach which is the cleaning approach by equipment according to claim 11, supplies positive pressure Ayr to vacuum Rhine from the nozzle hole of said adsorption conveyance arm to the source of a vacuum, or the source of negative pressure, and is characterized by spraying Ayr from said nozzle hole towards said predetermined location.
[Claim 19] Adsorbate detection equipment which is adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing, and is description characterized by arranging the proximity sensor in said predetermined location.
[Claim 20] It is adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing. The nozzle hole which leads to the source of a vacuum or the source of negative pressure while carrying out opening to said adsorption conveyance arm toward said stage side is formed. Adsorbate detection equipment characterized by arranging a distance detection means to measure the distance to the object which is in said adsorption conveyance arm in the direction which faces.
[Claim 21] The adsorbate detection approach characterized by recognizing the downward distance of said adsorption conveyance arm with said distance detection means while judging the existence of said adsorbate, when the detection distance by said distance detection means differs by the case where they are the case where it is the adsorbate detection approach by equipment according to claim 20, and said object is said adsorbate, and said stage.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the adsorbate detection equipment and the approach of having been suitable for IC test handler which has especially an adsorption conveyance arm about the adsorbate detection equipment and the approach of detecting the existence of the adsorbate.
[0002]
[Description of the Prior Art] Conventionally, detection of the adsorbate conveyed by the adsorption conveyance arm is performed using the pressure sensor, the transparency mold sensor, etc.
[0003] Then, the adsorbate detection equipment which used the transparency mold sensor for (a) of drawing 1 and (b) for the adsorbate detection equipment using a pressure sensor is shown in drawing 2 , and each configuration and actuation are explained below.
[0004] The equipment shown in drawing 1 is the configuration of having piped so that the horizontal direction and perpendicularly it has suction opening might be equipped with the movable arm 2 and the air of the suction opening circumference of an arm 2 might be drawn in the source of a vacuum, or the source of negative pressure (un-illustrating) through a pressure sensor 3. With this equipment, when an arm 2 descends to the location on which the adsorbate 1 should be put, the existence of the adsorbate 1 is judged by the pressure sensor 3. That is, since suction opening of an arm 2 is still a leak condition when an arm 2 descends and there is no adsorbate 1, when the fall of a pressure is not detected with a pressure sensor 3 but there is adsorbate 1, since there is nothing and the fall of a pressure is detected with a pressure sensor 3, leak with an arm 2 can judge the existence of the adsorbate 1.
[0005] Moreover, the equipment shown in drawing 2 arranges a transparency mold sensor in the location on which the adsorbate 1 should be put. This transparency mold sensor forms a beam of light which crosses the location on which the adsorbate 1 should be put width and from across with the luminescence sensor 4 and photo sensor 5 of a pair. With such equipment, the existence of the adsorbate 1 can be judged because the adsorbate 1 interrupts the beam of light formed by the light-emitting part 4 and light sensing portion 5 of a pair of a transparency mold sensor.
[0006]
[Problem(s) to be Solved by the Invention] However, in equipment as shown in drawing 1 , unless it drops an arm to the location on which the adsorbate is put, decision of the existence of the adsorbate cannot be performed. Moreover, even if the adjustment mistake of a pressure sensor does not adsorb in the adsorbate, there is a trouble that incorrect judgment that there is adsorbate may be made.
[0007] On the other hand, equipment as shown in drawing 2 cannot be used when it is impossible to attach a sensor in the width and the direction of slant of the adsorbate. Moreover, when distinguishing the existence of the adsorbate in much adsorption points, there is a trouble that many sensors are needed.
[0008] Compared with the configuration of the above-mentioned conventional technique, the purpose of this invention is excellent in a throughput, can detect the existence of the adsorbate certainly, and is to offer adsorbate detection equipment and an approach with an easy configuration by space-saving moreover.
[0009]
[Means for Solving the Problem] This invention is premised on the adsorbate detection equipment for detecting whether the adsorbate adsorption conveyance is carried out [the adsorbate] by the perpendicular and horizontally movable adsorption conveyance arm is in the predetermined location of a stage, or there is nothing in order to attain the above-mentioned purpose. And 1st invention is characterized by the following configurations. That is, while carrying out opening to said adsorption conveyance arm toward said stage side, the nozzle hole which leads to the source of a vacuum or the source of negative pressure is formed. The

light emitting device is arranged at the background of said predetermined location, or either of said adsorption conveyance arms. A through hole which does not interrupt the beam of light from said light emitting device is formed in said predetermined location. And the photo detector for receiving the beam of light from said light emitting device on said background of a predetermined location where said light emitting device is not arranged, or said adsorption conveyance arm is arranged. As for especially said light emitting device or photo detector, it is desirable to be arranged in the inner part of the nozzle hole of said adsorption conveyance arm.

[0010] Moreover, 2nd invention is characterized by the following configurations. That is, the reflective object is arranged at either the front face of said predetermined location, or said adsorption conveyance arm. And the photo detector for receiving the beam of light from a light emitting device and this light emitting device through said reflective object on said front face of a predetermined location where said reflective object is not arranged, or said adsorption conveyance arm is arranged. As for especially the group of said light emitting device and a photo detector or said reflective object, it is desirable to be arranged in the inner part of the nozzle hole of said adsorption conveyance arm.

[0011] In these equipments, the upper part of said adsorption conveyance arm containing the group of the light emitting device arranged in the inner part of said adsorption nozzle hole, a photo detector, a reflective object or a light emitting device, and a photo detector could become the sensor unit which became independent of said adsorption conveyance arm through the optical fiber. Or the sensor unit which became independent of said adsorption conveyance arm may be fixed to the location which faces said predetermined location, and said adsorption conveyance arm may be the structure where the beam of light from a light emitting device can be passed.

[0012] Moreover, it is the adsorbate detection approach by the equipment concerning the 1st or 2nd above-mentioned invention, and when moving said adsorption conveyance arm above said predetermined location, the 3rd invention judges it as those with the adsorbate, when said photo detector is not receiving light, and when light is being received, it is characterized by judging that he has no adsorbate.

[0013] In this approach, after forming a pressure sensor all over vacuum Rhine from the nozzle hole of said adsorption conveyance arm to the source of a vacuum, or the source of negative pressure and judging it as those with the adsorbate by said photo detector, it is more desirable to move said adsorption conveyance arm to said predetermined location the bottom, to carry out suction actuation, and to check the existence of the adsorbate again with said pressure sensor.

[0014] Moreover, the 4th invention is the approach of detecting a location gap of an adsorption conveyance arm using the equipment concerning the 1st or 2nd above-mentioned invention, and it is in the condition which does not have the adsorbate in said predetermined location. When moving said adsorption conveyance arm above said predetermined location from a criteria location and said photo detector does not receive the beam of light from said light emitting device, it is characterized by judging that the location of said adsorption conveyance arm has shifted to said predetermined location. In this case, after judging that the location of said adsorption conveyance arm has shifted to said predetermined location, The horizontal migration of said adsorption conveyance arm is made to carry out in the direction of arbitration until said photo detector receives the beam of light from said light emitting device. It is more desirable to amend the position coordinate when moving said adsorption conveyance arm above said predetermined location based on the position coordinate recognized by the migration means of said adsorption conveyance arm when said photo detector receives light.

[0015] Moreover, the 5th invention is the cleaning approach by the equipment concerning the 1st or 2nd above-mentioned invention, and is characterized also by supplying positive pressure Ayr to vacuum Rhine from the nozzle hole of said adsorption conveyance arm to the source of a vacuum, or the source of negative pressure, and spraying Ayr from said nozzle hole towards said predetermined location. Moreover, 6th invention is characterized by being adsorbate detection equipment with which the proximity sensor is arranged in said predetermined location.

[0016] Moreover, 7th invention is characterized by being adsorbate detection equipment with which a distance detection means to measure the distance to the object which is in said adsorption conveyance arm in the direction which faces is arranged. And the adsorbate detection approach by this equipment is characterized by recognizing the downward distance of said adsorption conveyance arm with said distance detection means while it judges the existence of said adsorbate, when the detection distance by said distance detection means differs by the case where they are the case where said object is said adsorbate, and said stage.

[0017]

[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing.

[0018] Drawing 3 is a typical sectional view showing the adsorbate detection equipment of this invention, and 1 operation gestalt of an approach. The equipment of the gestalt shown in this drawing is equipped with the adsorption conveyance arm 12 for adsorbing the adsorbate 11 and conveying in the horizontal and vertical direction. Specifically, said arm 12 has the nozzle hole which carries out opening towards the bottom. Drawer opening for pulling out the air of said nozzle hole to the source of a vacuum or the source of negative pressure (un-illustrating) is arranged in the flank of said arm 12. And adsorption of the adsorbate 1 is attained at the opening edge of said nozzle hole by actuation of the source of a vacuum, or the source of negative pressure.

[0019] The upward luminescence sensor 14 is arranged on the background of the location on which the adsorbate 11 is due to be put on a stage 13, and the adsorbate 11 of this stage 13 is put. A through hole which does not interrupt the upward beam of light of the luminescence sensor 14 has opened in the location on which the adsorbate 11 is put. On the other hand, in the inner part of said nozzle hole of the adsorption conveyance arm 12, the downward photo sensor 15 for receiving the beam of light from the luminescence sensor 14 is arranged. This photo sensor 15 and the luminescence sensor 14 are pairs, and constitute the so-called transparency mold sensor. In addition, it may be covered with the lid of the photo sensor 15 in said adsorption nozzle hole by the permeate 16. Moreover, the luminescence sensor 14 may be arranged in an adsorption conveyance arm side, and the photo sensor 15 may be arranged in the stage side. Moreover, the luminescence sensor 14 or the photo sensor 15 may be attached in the outside of an adsorption conveyance arm.

[0020] With the equipment of such a gestalt, the adsorption conveyance arm 12 is first moved above the location on which the adsorbate 11 of a stage 13 is put. At this time, when the adsorbate 11 is in a stage 13, the adsorbate 11 has interrupted the upward beam of light of the luminescence sensor 14. For the reason, the photo sensor 15 in the adsorption conveyance arm 12 does not react. Since it can be judged as those with the adsorbate from this thing, as usual, the adsorption conveyance arm 12 moves the bottom, adsorbs the adsorbate 11 and upper-moves. On the other hand, when there is no adsorbate 11 in a stage 13, the beam of light from the luminescence sensor 14 on the background of a stage 13 reaches the photo sensor 15 in the adsorption conveyance arm 12, and a photo sensor 15 reacts. While it can judge that he has no adsorbate from this thing, the check of an arm migration location is also carried out. Furthermore, with such equipment, not performing migration under the adsorption conveyance arm 12 can also check the existence of the adsorbate, and since there is no useless vertical migration compared with the conventional technique shown in drawing 1 , a throughput improves.

[0021] Moreover, with this gestalt, by supplying positive pressure Ayr to vacuum Rhine from a nozzle hole to the source of a vacuum, or the source of negative pressure, Ayr can be sprayed on the top face of the luminescence sensor 14 to which dust, dust, etc. on a background of a stage 13 tend to adhere from a nozzle hole, and a sensor can be cleaned easily.

[0022] However, with this gestalt, although there is no adsorbate 11 on a stage 13 when the halt location of an arm 12 has shifted to the luminescence sensor 14 since it is judged as those with the adsorbate when a photo sensor 15 does not receive the beam of light of the luminescence sensor 14, a sensor may incorrect-judge that it is. In this case, an arm location gap can be judged by installing a pressure sensor as shown in vacuum Rhine from a nozzle hole to the source of a vacuum, or the source of negative pressure at drawing 1 . That is, after moving an arm 12 the bottom and performing suction actuation, an arm location gap can be judged by checking the existence of the adsorbate 11 again with a pressure sensor.

[0023] Moreover, even if it uses the sensor which can perform thickness of the adsorbate, or distance detection to the adsorbate, without using a pressure sensor, the check of the existence of the adsorbate and an arm location gap can be performed.

[0024] Not only the gestalt of the above [this invention] but other gestalten which are explained below are considered. Drawing 7 shows the typical sectional view of the adsorbate detection equipment of this invention, and other operation gestalten of an approach from drawing 4 . Moreover, in explanation and the drawing of other gestalten, the same sign is given to the same component as the above-mentioned gestalt, and the overlapping explanation is omitted.

[0025] With the equipment of the gestalt shown in drawing 4 , the reflective object 17 is arranged on the front face of the location on which the adsorbate 11 of a stage 13 is put. And the reflective mold sensor which consists of the luminescence sensors 14 and photo sensors 15 of a pair in the inner part of the nozzle hole of the adsorption conveyance arm 12 is arranged. In addition, it may be covered with the lid of the

reflective mold sensor in said nozzle hole by the permeate 16. Moreover, the luminescence sensor 14 and photo sensor 15 of a pair may be arranged in a stage side, and the reflective object 17 may be arranged in the adsorption conveyance arm side. Moreover, the luminescence sensor 14 and the photo sensor 15, or the reflective object 17 of a pair may be attached in the outside of an adsorption conveyance arm. Also with the equipment of this gestalt, the adsorption conveyance arm 12 is first moved above the location on which the adsorbate 1 of a stage 13 is put. At this time, when the adsorbate 11 is in a stage 13, the reflective object 17 is covered with the adsorbate 11. For the reason, the photo sensor 15 in the adsorption conveyance arm 12 does not react. Since it can be judged as those with the adsorbate from this thing, as usual, the adsorption conveyance arm 12 moves the bottom, adsorbs the adsorbate 11 and upper-moves. On the other hand, when there is no adsorbate 11 in a stage 13, the beam of light from the luminescence sensor 14 is reflected by the reflective object 17, a photo sensor 15 is reached, and a photo sensor 15 reacts. While it can judge that he has no adsorbate from this thing, the check of an arm migration location can also be performed. Furthermore, with such equipment, since there is no useless vertical migration like the above-mentioned gestalt compared with the conventional technique shown in drawing 1 , a throughput improves.

[0026] Moreover, also with this gestalt, by supplying positive pressure Ayr to vacuum Rhine from an adsorption nozzle hole to the source of a vacuum, or the source of negative pressure, Ayr can be sprayed on the top face of the reflective object 17 of a stage 13 from an adsorption nozzle, and the reflective object 17 can be cleaned easily.

[0027] However, also in this gestalt, although there is no adsorbate 11 on a stage 13 when the halt location of an arm 12 has shifted to the reflective object 17 since it is judged as those with the adsorbate when a photo sensor 15 does not receive the reflected light of the luminescence sensor 14 by the reflective object 17, a sensor may incorrect-judge that it is. In this case, an arm location gap can be judged by installing a pressure sensor as shown in vacuum Rhine from a nozzle hole to the source of a vacuum, or the source of negative pressure at drawing 1 . That is, after moving an arm 12 the bottom and performing suction actuation, an arm location gap can be judged by checking the existence of the adsorbate 11 further with a pressure sensor.

[0028] Moreover, even if it uses the sensor which can perform thickness of the adsorbate, or distance detection to the adsorbate like the above-mentioned gestalt, without using a pressure sensor, the check of the existence of the adsorbate and an arm location gap can be performed.

[0029] This invention other than the two above gestalten may be equipment which made the sensor part (only a photo sensor is [in the case of a transparency mold sensor] the group of luminescence and a photo sensor in the case of a reflective mold sensor) of the upper part of the adsorption conveyance arm 12 shown in drawing 3 or drawing 4 , i.e., the back of a nozzle hole, the sensor unit 19 which became independent of the adsorption conveyance arm 12 as shown in drawing 5 , and connected the sensor unit 19 and the nozzle hole of the adsorption conveyance arm 12 with the optical fiber 18.

[0030] Moreover, you may be equipment fixed so that it might counter with the luminescence sensor 14 on stage 13 background which showed the above sensor units 19 to drawing 3 as shown in drawing 6 , or the reflective object 17 on the stage 13 shown in drawing 4 . In addition, while having penetrated to the upper limit of the adsorption conveyance arm 12, it is covered with the lid of the back of a nozzle hole by the permeate 16, so that the beam of light of a sensor can pass through the inside of the adsorption conveyance arm 12 in this case.

[0031] Furthermore, as it changes to the equipment containing a reflective mold sensor as shown in a transparency mold sensor or drawing 4 as shown in drawing 3 and is shown in drawing 7 , you may be equipment which installed the proximity sensor 20 in the location on which the adsorbate 11 of a stage 13 is put.

[0032] In addition, self-recognition of the downward distance to the adsorbate of an adsorption conveyance arm can also be carried out to an adsorption conveyance arm by arranging the distance detection sensor which measures the distance to the object which exists in the direction which faces. Therefore, if a servo motor is used for the vertical migration equipment of an adsorption conveyance arm, even if the height of the adsorbate changes, the downward stroke of the adsorption conveyance arm when adsorbing the adsorbate can be easily adjusted based on the recognized downward distance. This thing is effective in a maintenance compared with the case where the vertical migration equipment of an adsorption conveyance arm is an air cylinder. That is, if the height of the adsorbate changes when vertical migration equipment is an air cylinder, adjustment will take time amount and time and effort as it is as adjusting the stage height of the adsorbate **** [and]. [adjusting the fitting location of an air cylinder]

[0033] Moreover, in case the horizontal migration of the adsorption conveyance arm is made to carry out

above a predetermined location from a criteria location, the halt location of an arm may shift to a predetermined location. This thing happens by the following causes. Generally, the position coordinate of a predetermined location is beforehand asked for the criteria location as a zero. And the migration equipment of an adsorption conveyance arm calculates movement magnitude with reference to the position coordinate of a predetermined location, and only the movement magnitude is moving [equipment] the adsorption conveyance arm from the criteria location. However, if conveyance is repeated for a long time, a transport device will deteriorate and the criteria location of an arm will be out of order. If it becomes like this, even if only the movement magnitude calculated with reference to the position coordinate of a predetermined location moves an adsorption conveyance arm from a criteria location, the halt location of an arm will shift to a predetermined location. Consequently, the adsorbate in a predetermined location cannot be adsorbed, or even if it is able to adsorb, it cannot convey correctly in the next conveyance location.

[0034] According to this invention, a location gap of such an arm is also detectable. That is, the horizontal migration of the adsorption conveyance arm is made to carry out above a predetermined location from a criteria location in the condition that there is no adsorbate in a predetermined location. When a photo sensor does not receive the beam of light from a luminescence sensor at this time, it can be judged that the location of an adsorption conveyance arm has shifted to a predetermined location. Moreover, the horizontal migration of the adsorption conveyance arm is made to carry out in the direction of arbitration, after judging that the halt location of an adsorption conveyance arm is shifted in this way until a photo sensor receives the beam of light from a luminescence sensor. And based on the position coordinate recognized by the migration equipment of an adsorption conveyance arm when a photo sensor receives light, the position coordinate when moving an adsorption conveyance arm above the predetermined location is amended. Thereby, the location gap of an adsorption conveyance arm to a predetermined location is corrected, and the adsorbate in a predetermined location can be correctly conveyed in the next conveyance location. And since it is the structure which has the location gap detection section in the nozzle of an adsorption conveyance arm, compared with the equipment which detects a location gap, for example using a camera, it will become very small.

[0035]

[Effect of the Invention] As explained above, this invention prepared the through hole which does not interrupt the light of a light emitting device in the location on which said adsorbate is put while having arranged the light emitting device to the background of the location on which the adsorbate is put, or either of the adsorption conveyance arms. And the photo detector for receiving the beam of light from said light emitting device on the background or adsorption conveyance arm of the location on which the adsorbate is put by which said light emitting device is not arranged has been arranged. Or the photo detector for receiving the beam of light of a light emitting device and this light emitting device through said reflective object on the front face or adsorption conveyance arm of the location on which said adsorbate is put which arranges a reflective object on either the front face of the location on which said adsorbate is put, or an adsorption conveyance arm and by which this reflective object is not arranged has been arranged. By this thing, in decision of the existence of the adsorbate, since it is not necessary to carry out useless vertical migration like the conventional technique only by the pressure sensor, a throughput improves. Moreover, since the adsorbate is perpendicularly detectable, it is not necessary to take many tooth spaces superficial for installation of a sensor, and the number of sensors can also be reduced from the conventional technique.

[0036] Moreover, with such equipment, the check of a location gap of a conveyance adsorption arm can also be performed. And if it combines with the conventional technique using a pressure sensor, detection of the existence of the more exact adsorbate can be performed. Furthermore, positive pressure Ayr can be supplied to vacuum Rhine of an adsorption conveyance arm, and cleaning of the luminescence sensor arranged on said predetermined location or a reflective object can also be performed by making Ayr blow off from an adsorption nozzle.

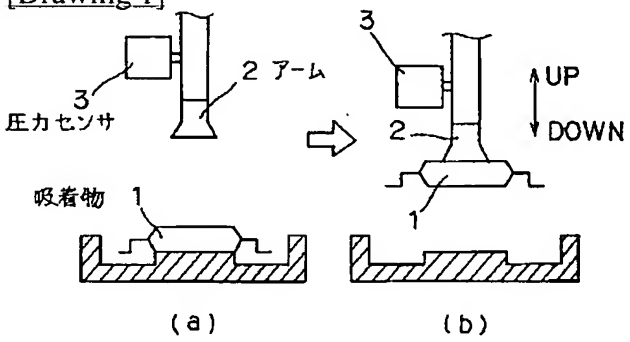
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



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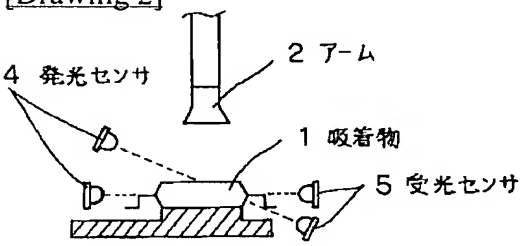
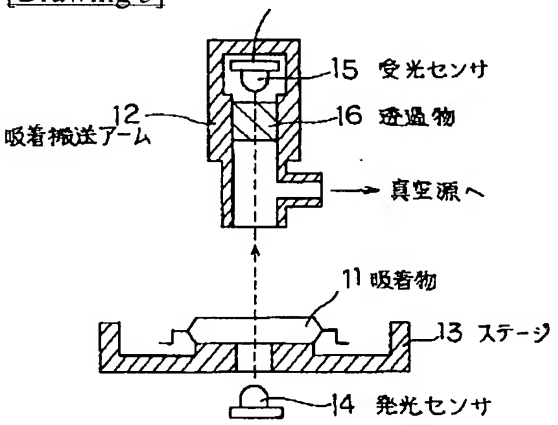
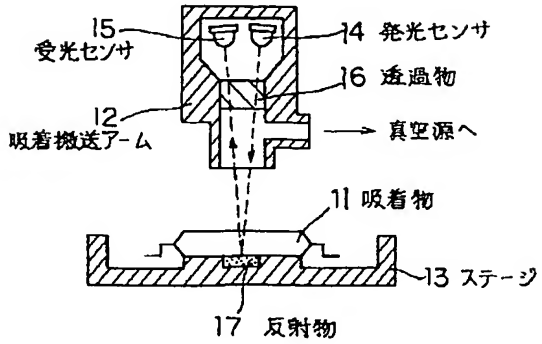


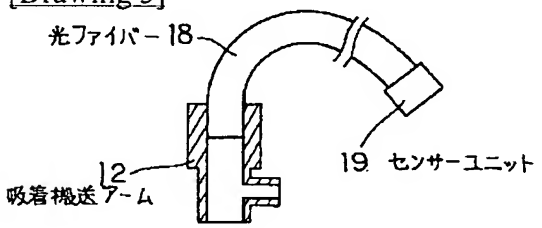
[Drawing 3]



[Drawing 4]



[Drawing 5]



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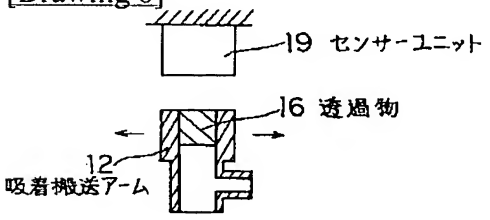
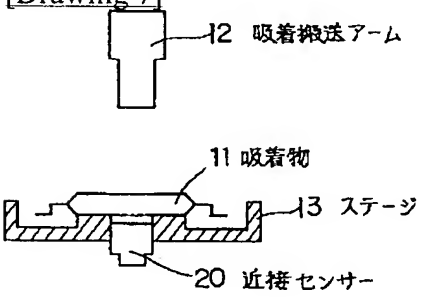


[Drawing 7]



[Translation done.]

引用文献 4

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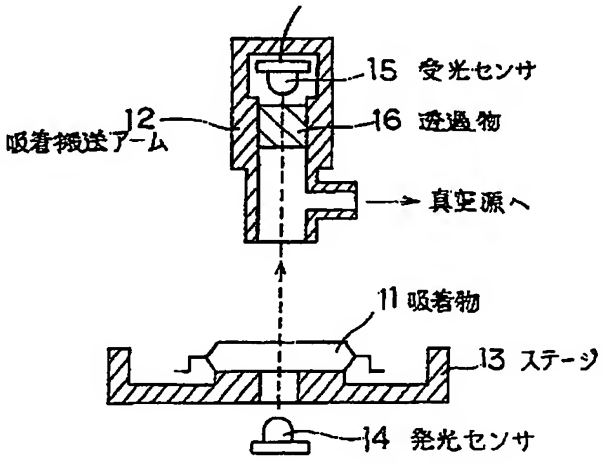
(54)【発明の名称】吸着物検知装置、該装置を用いた吸着物検知方法、該装置を用いた位置ずれ検知方法、および該装置を用いた清掃方法

(57)【要約】

【課題】　スループットにすぐれ、確実に吸着物の有無が検知でき、しかも省スペースで構成が簡単な吸着物検知装置等を提供する。

【解決手段】　この装置は、ノズル穴で吸着物１１を真空吸着して水平及び垂直の方向に搬送するための吸着搬送アーム１２を備えている。ステージ１３の、吸着物１１が置かれる部分の裏側には、上向きの発光センサ１４が配置されている。その吸着物１１が置かれる部分には発光センサ１４の上向きの光線を遮らないような貫通穴が開けられている。一方、吸着搬送アーム１２のノズル穴の奥には、発光センサ１４からの光線を受光するための下向きの受光センサ１５が配置されている。



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【特許請求の範囲】

【請求項１】　垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置であって、

前記吸着搬送アームには、前記ステージ側に向いて開口していると共に真空源又は負圧源に通じているノズル穴が形成されており、

前記所定の場所の裏側もしくは前記吸着搬送アームのいずれか一方に発光素子が配置され、

前記所定の場所には前記発光素子からの光線を遮らないような貫通穴が設けられ、

前記発光素子が配置されていない、前記所定の場所の裏側もしくは前記吸着搬送アームに、前記発光素子からの光線を受光するための受光素子が配置されていることを特徴とする、吸着物検知装置。

【請求項２】　垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置であって、

前記吸着搬送アームには、前記ステージ側に向いて開口していると共に真空源又は負圧源に通じているノズル穴が形成されており、

前記所定の場所の裏側もしくは前記吸着搬送アームのノズル穴の奥のいずれか一方に発光素子が配置され、

前記所定の場所には前記発光素子からの光線を遮らないような貫通穴が設けられ、

前記発光素子が配置されていない、前記所定の場所の裏側もしくは前記吸着搬送アームのノズル穴の奥に、前記発光素子からの光線を受光するための受光素子が配置されていることを特徴とする、吸着物検知装置。

【請求項３】　前記ノズル穴の奥に配置された発光素子もしくは受光素子を含む前記吸着搬送アームの上部が、光ファイバーを介して前記吸着搬送アームから独立したセンサーユニットに成っている、請求項２に記載の吸着物検知装置。

【請求項４】　前記ノズル穴の奥に配置された発光素子もしくは受光素子を含む前記吸着搬送アームの上部が、前記吸着搬送アームから独立したセンサーユニットに成っており、該センサーユニットは前記所定の場所と相対する位置に固定され、前記吸着搬送アームは発光素子からの光線が通過可能な構造である、請求項２に記載の吸着物検知装置。

【請求項５】　請求項２に記載の装置による吸着物検知方法であって、前記吸着搬送アームを前記所定の場所の上方に移動させたとき、前記受光素子が受光していない場合に吸着物有りと判断し、受光している場合には吸着物無しと判断することを特徴とする、吸着物検知方法。

【請求項６】　請求項５に記載の吸着物検知方法において、前記吸着搬送アームのノズル穴から真空源又は負圧

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源までの真空ライン中に圧力センサを設け、前記受光素子により吸着物有りと判断した後、前記吸着搬送アームを前記所定の場所に下移動して吸引動作させ、前記圧力センサで吸着物の有り無しを再度確認することを特徴とする、吸着物検知方法。

【請求項７】　請求項２に記載の装置を用いて吸着搬送アームの位置ずれを検出する方法であって、前記所定の場所に吸着物が無い状態で、基準位置から前記所定の場所の上方に前記吸着搬送アームを移動させた時に、前記発光素子からの光線を前記受光素子が受光しない場合、前記所定の場所に対して前記吸着搬送アームの位置がずれていると判断することを特徴とする、位置ずれ検出方法。

【請求項８】　請求項７に記載の位置ずれ検出方法において、前記所定の場所に対して前記吸着搬送アームの位置がずれていると判断した後、前記発光素子からの光線を前記受光素子が受光するまで前記吸着搬送アームを任意の方向に水平移動させ、前記受光素子が受光した時の、前記吸着搬送アームの移動手段により認識される位置座標に基づいて、前記吸着搬送アームを前記所定の場所の上方に移動させるときの位置座標を補正することを特徴とする、位置ずれ検出方法。

【請求項９】　請求項２に記載の装置による清掃方法であって、前記吸着搬送アームのノズル穴から真空源又は負圧源までの真空ラインに正圧エアーを供給して、前記所定の場所に向けて前記ノズル穴よりエアーを吹き付けることを特徴とする、清掃方法。

【請求項１０】　垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置であって、

前記吸着搬送アームには、前記ステージ側に向いて開口していると共に真空源又は負圧源に通じているノズル穴が形成されており、

前記所定の場所の表面もしくは前記吸着搬送アームのいずれか一方に反射物が配置され、

前記反射物が配置されていない、前記所定の場所の表面もしくは前記吸着搬送アームに、発光素子及び、該発光素子からの光線を前記反射物を介して受光するための受光素子が配置されていることを特徴とする、吸着物検知装置。

【請求項１１】　垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置であって、

前記吸着搬送アームには、前記ステージ側に向いて開口していると共に真空源又は負圧源に通じているノズル穴が形成されており、

前記所定の場所の表面もしくは前記吸着搬送アームのノズル穴の奥のいずれか一方に反射物が配置され、

前記反射物が配置されていない、前記所定の場所の表面もしくは前記吸着搬送アームのノズル穴の奥に、発光素子及び、該発光素子からの光線を前記反射物を介して受光するための受光素子が配置されていることを特徴とする、吸着物検知装置。

【請求項１２】　前記ノズル穴の奥に配置された反射物もしくは発光素子と受光素子の組を含む、前記吸着搬送アームの上部が、光ファイバーを介して前記吸着搬送アームから独立したセンサーユニットに成っている、請求項１１に記載の吸着物検知装置。

【請求項１３】　前記ノズル穴の奥に配置された反射物もしくは発光素子と受光素子の組を含む、前記吸着搬送アームの上部が、前記吸着搬送アームから独立したセンサーユニットに成っており、
該センサーユニットは前記所定の場所と相対する位置に固定され、
前記吸着搬送アームは発光素子からの光線が通過可能な構造である、請求項１１に記載の吸着物検知装置。

【請求項１４】　請求項１１に記載の装置による吸着物検知方法であって、前記吸着搬送アームを前記所定の場所の上方に移動させたとき、前記受光素子が受光していない場合に吸着物有りと判断し、受光している場合には吸着物無しと判断することを特徴とする、吸着物検知方法。

【請求項１５】　請求項１４に記載の吸着物検知方法において、前記吸着搬送アームのノズル穴から真空源又は負圧源までの真空ライン中に圧力センサを設け、前記受光素子により吸着物有りと判断した後、前記吸着搬送アームを前記所定の場所に下移動して吸引動作させ、前記圧力センサで吸着物の有り無しを再度確認することを特徴とする、吸着物検知方法。

【請求項１６】　請求項１１に記載の装置を用いて吸着搬送アームの位置ずれを検出する方法であって、前記所定の場所に吸着物が無い状態で、基準位置から前記所定の場所の上方に前記吸着搬送アームを移動させた時に、前記発光素子からの光線を前記受光素子が受光しない場合、前記所定の場所に対して前記吸着搬送アームの位置がずれていると判断することを特徴とする、位置ずれ検出方法。

【請求項１７】　請求項１６に記載の位置ずれ検出方法において、前記所定の場所に対して前記吸着搬送アームの位置がずれていると判断した後、前記発光素子からの光線を前記受光素子が受光するまで前記吸着搬送アームを任意の方向に水平移動させ、前記受光素子が受光した時の、前記吸着搬送アームの移動手段により認識される位置座標に基づいて、前記吸着搬送アームを前記所定の場所の上方に移動させるときの位置座標を補正することを特徴とする、位置ずれ検出方法。

【請求項１８】　請求項１１に記載の装置による清掃方法であって、前記吸着搬送アームのノズル穴から真空源又は負圧源までの真空ラインに正圧エアーを供給して、前記所定の場所に向けて前記ノズル穴よりエアーを吹き付けることを特徴とする、清掃方法。

【請求項１９】　垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置であって、
前記所定の場所に近接センサが配置されていることを特徴特徴とする、吸着物検知装置。

【請求項２０】　垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置であって、
前記吸着搬送アームには、前記ステージ側に向いて開口していると共に真空源又は負圧源に通じているノズル穴が形成されており、
前記吸着搬送アームに、相対する方向に在る対象物までの距離を測定する距離検出手段が配置されていることを特徴とする、吸着物検知装置。

【請求項２１】　請求項２０に記載の装置による吸着物検知方法であって、前記対象物が前記吸着物である場合と前記ステージである場合とで前記距離検出手段による検出距離が異なることにより前記吸着物の有無を判断するとともに、前記距離検出手段により前記吸着搬送アームの下降距離も認識することを特徴とする、吸着物検知方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、吸着物の有無を検知できる吸着物検知装置および方法に関し、特に吸着搬送アームを有するＩＣテストハンドラーに適した吸着物検知装置および方法に関する。

【０００２】

【従来の技術】従来、吸着搬送アームによって搬送される吸着物の検知は、例えば圧力センサや透過型センサなどを用いて行なわれている。

【０００３】そこで、圧力センサを用いた吸着物検知装置を図１の（ａ）及び（ｂ）に、透過型センサを用いた吸着物検知装置を図２に示し、それぞれの構成及び動作を以下に説明する。

【０００４】図１に示される装置は、吸引口を有する水平方向や垂直方向に移動可能なアーム２を備え、アーム２の吸引口周辺の空気を圧力センサ３を経て真空源又は負圧源（不図示）に引き込むように配管した構成である。この装置では、吸着物１が置かれるはずの場所にアーム２が下降された際に、圧力センサ３により吸着物１の有無が判断される。つまり、アーム２が下降した際に吸着物１が無いときはアーム２の吸引口はリーク状態のままなので、圧力センサ３で圧力の低下が検知されず、吸着物１が有るときはアーム２でのリークは無く、圧力

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センサ３で圧力の低下が検知される事から、吸着物１の有無が判断できる。

【０００５】また、図２に示される装置は、吸着物１が置かれるはずの場所に透過型センサを配置したものである。この透過型センサーは、吸着物１が置かれるはずの場所を横及び斜め方向から横切るような光線を、一対の発光センサ４及び受光センサ５で形成している。このような装置では、透過型センサの一対の発光部４及び受光部５で形成される光線を吸着物１が遮ることで、吸着物１の有無が判断できる。

【０００６】

【発明が解決しようとする課題】しかしながら、図１に示すような装置においては、吸着物の置かれる場所にアームを下降させないと吸着物の有無の判断ができない。また、圧力センサの調整ミスにより吸着物が吸着されていなくても吸着物が有るという誤判断をすることがあるという問題点がある。

【０００７】一方、図２に示すような装置は、吸着物の横及び斜め方向にセンサを取り付けることが不可能な時は使用できない。また、多数の吸着ポイントにおいて吸着物の有無を判別する場合は、多数個のセンサが必要になるという問題点がある。

【０００８】本発明の目的は、上記の従来技術の構成に比べ、スループットにすぐれ、確実に吸着物の有無が検知でき、しかも省スペースで構成が簡単な吸着物検知装置および方法を提供することにある。

【０００９】

【課題を解決するための手段】上記目的を達成するために本発明は、垂直及び水平方向に移動可能な吸着搬送アームによって吸着搬送される吸着物がステージの所定の場所に有るか無いかを検知するための吸着物検知装置を前提としている。そして第１の発明は次のような構成を特徴とする。すなわち、前記吸着搬送アームに、前記ステージ側に向いて開口していると共に真空源又は負圧源に通じているノズル穴が形成されている。前記所定の場所の裏側もしくは前記吸着搬送アームのいずれか一方に発光素子が配置されている。前記所定の場所には前記発光素子からの光線を遮らないような貫通穴が形成されている。そして、前記発光素子が配置されていない、前記所定の場所の裏側もしくは前記吸着搬送アームに、前記発光素子からの光線を受光するための受光素子が配置されている。特に、前記発光素子もしくは受光素子は前記吸着搬送アームのノズル穴の奥に配置されていることが好ましい。

【００１０】また、第２の発明は次のような構成を特徴とする。すなわち、前記所定の場所の表面もしくは前記吸着搬送アームのいずれか一方に反射物が配置されている。そして、前記反射物が配置されていない、前記所定の場所の表面もしくは前記吸着搬送アームに、発光素子及び、該発光素子からの光線を前記反射物を介して受光するための受光素子が配置されている。特に、前記発光素子及び受光素子の組、または前記反射物は、前記吸着搬送アームのノズル穴の奥に配置されていることが好ましい。

【００１１】これらの装置において、前記吸着ノズル穴の奥に配置された発光素子もしくは受光素子、または反射物もしくは発光素子と受光素子の組を含む、前記吸着搬送アームの上部は、光ファイバーを介して前記吸着搬送アームから独立したセンサーユニットに成っていてもよい。あるいは、前記吸着搬送アームから独立したセンサーユニットは前記所定の場所と相対する位置に固定され、前記吸着搬送アームは発光素子からの光線が通過可能な構造であってもよい。

【００１２】また第３の発明は、上記の第１または第２の発明に係る装置による吸着物検知方法であって、前記吸着搬送アームを前記所定の場所の上方に移動させたとき、前記受光素子が受光していない場合に吸着物有りと判断し、受光している場合には吸着物無しと判断することを特徴とする。

【００１３】この方法においては、前記吸着搬送アームのノズル穴から真空源又は負圧源までの真空ライン中に圧力センサを設け、前記受光素子により吸着物有りと判断した後、前記吸着搬送アームを前記所定の場所に下移動して吸引動作させ、前記圧力センサで吸着物の有り無しを再度確認することがより好ましい。

【００１４】また第４の発明は、上記の第１または第２の発明に係る装置を用いて吸着搬送アームの位置ずれを検出する方法であって、前記所定の場所に吸着物が無い状態で、基準位置から前記所定の場所の上方に前記吸着搬送アームを移動させた時に、前記発光素子からの光線を前記受光素子が受光しない場合、前記所定の場所に対して前記吸着搬送アームの位置がずれていると判断することを特徴とする。この場合、前記所定の場所に対して前記吸着搬送アームの位置がずれていると判断した後、前記発光素子からの光線を前記受光素子が受光するまで前記吸着搬送アームを任意の方向に水平移動させ、前記受光素子が受光した時の、前記吸着搬送アームの移動手段により認識される位置座標に基づいて、前記吸着搬送アームを前記所定の場所の上方に移動させるときの位置座標を補正することがより好ましい。

【００１５】また第５の発明は、上記の第１または第２の発明に係る装置による清掃方法であって、前記吸着搬送アームのノズル穴から真空源又は負圧源までの真空ラインに正圧エアーを供給して、前記所定の場所に向けて前記ノズル穴よりエアーを吹き付けることも特徴とする。　また第６の発明は、前記所定の場所に近接センサが配置されている吸着物検知装置であることを特徴とする。

【００１６】また第７の発明は、前記吸着搬送アームに、相対する方向に在る対象物までの距離を測定する距

離検出手段が配置されている吸着物検知装置であることを特徴とする。そして、この装置による吸着物検知方法は、前記対象物が前記吸着物である場合と前記ステージである場合とで前記距離検出手段による検出距離が異なることにより前記吸着物の有無を判断するとともに、前記距離検出手段により前記吸着搬送アームの下降距離も認識することを特徴とする。

【００１７】

【発明の実施の形態】次に、本発明の実施の形態について図面を参照して説明する。

【００１８】図３は本発明の吸着物検知装置及び方法の一実施形態を表す模式的断面図である。この図に示す形態の装置は、吸着物１１を吸着して水平及び垂直の方向に搬送するための吸着搬送アーム１２を備えている。具体的には、前記アーム１２は下側に向けて開口するノズル穴を有する。前記アーム１２の側部には前記ノズル穴の空気を真空源又は負圧源（不図示）へと引き出すための引出口が配設されている。そして、真空源又は負圧源の作動により前記ノズル穴の開口端で吸着物１が吸着可能になっている。

【００１９】吸着物１１はステージ１３に置かれる予定になっており、このステージ１３の、吸着物１１が置かれる場所の裏側には、上向きの発光センサ１４が配置されている。その吸着物１１が置かれる場所には発光センサ１４の上向きの光線を遮らないような貫通穴が開けられている。一方、吸着搬送アーム１２の前記ノズル穴の奥には、発光センサ１４からの光線を受光するための下向きの受光センサ１５が配置されている。この受光センサ１５と発光センサ１４は一対で、いわゆる透過型センサを構成する。尚、前記吸着ノズル穴内の受光センサ１５は透過物１６により蓋されていても良い。また、発光センサ１４が吸着搬送アーム側に配設され、受光センサ１５がステージ側に配設されていてもよい。また、発光センサ１４もしくは受光センサ１５は吸着搬送アームの外側に取り付けられていてもよい。

【００２０】このような形態の装置では、まず、ステージ１３の、吸着物１１が置かれる場所の上方に吸着搬送アーム１２が移動される。このとき、ステージ１３に吸着物１１が有る場合は吸着物１１は発光センサ１４からの上向きの光線を遮っている。その為、吸着搬送アーム１２内の受光センサ１５は反応しない。この事から吸着物有りと判断できるので、通常どおり吸着搬送アーム１２は下移動し、吸着物１１を吸着し、上移動する。一方、ステージ１３に吸着物１１が無い場合はステージ１３の裏側の発光センサ１４からの光線が吸着搬送アーム１２内の受光センサ１５に到達し、受光センサ１５が反応する。この事から吸着物無しと判断できると同時に、アーム移動位置の確認もされる。さらに、このような装置では吸着搬送アーム１２の下移動を行なわないでも吸着物の有無が確認でき、図１に示した従来技術に比べて

無駄な上下移動が無いのでスループットが向上する。

【００２１】また、この形態では、ノズル穴から真空源又は負圧源までの真空ラインに正圧エアーを供給することで、ステージ１３の裏側の、埃や塵などが付着しやすい発光センサ１４の上面にノズル穴よりエアーを吹き付けて、センサの清掃を容易に行なうことができる。

【００２２】但し、この形態では受光センサ１５が発光センサ１４の光線を受けない時に吸着物有りと判断している為、アーム１２の停止位置が発光センサ１４に対してずれていた場合、ステージ１３上に吸着物１１が無いにもかかわらず、有るとセンサが誤判断する事がある。この場合、ノズル穴から真空源又は負圧源までの真空ラインに図１に示したような圧力センサを設置することにより、アーム位置ずれが判断できる。すなわち、アーム１２を下移動して吸引動作を行なった後、圧力センサで吸着物１１の有り無しを再度確認することにより、アーム位置ずれが判断できる。

【００２３】また、圧力センサを使用せずに、吸着物の厚さ若しくは吸着物までの距離検出を行なえるセンサ等を使用しても、吸着物の有無とアーム位置ずれの確認ができる。

【００２４】本発明は上記の形態に限らず、以下に説明するような他の形態も考えられる。図４から図７は本発明の吸着物検知装置及び方法の他の実施形態の模式的断面図を示す。また、他の形態の説明及び図面において上記の形態と同一の構成要素には同一符号を付し、重複する説明は省略する。

【００２５】図４に示す形態の装置では、ステージ１３の、吸着物１１が置かれる場所の表面に反射物１７が配置される。そして、吸着搬送アーム１２のノズル穴の奥に、一対の発光センサ１４及び受光センサ１５から構成される反射型センサが配置されている。尚、前記ノズル穴内の反射型センサは透過物１６により蓋されていても良い。また、一対の発光センサ１４及び受光センサ１５がステージ側に配設され、反射物１７が吸着搬送アーム側に配設されていてもよい。また、一対の発光センサ１４及び受光センサ１５、もしくは反射物１７は吸着搬送アームの外側に取り付けられていてもよい。　この形態の装置でも、まず、ステージ１３の、吸着物１が置かれる場所の上方に吸着搬送アーム１２が移動される。このとき、ステージ１３に吸着物１１が有る場合は吸着物１１によって反射物１７が覆われる。その為、吸着搬送アーム１２内の受光センサ１５は反応しない。この事から吸着物有りと判断できるので、通常どおり吸着搬送アーム１２は下移動し、吸着物１１を吸着し、上移動する。一方、ステージ１３に吸着物１１が無い場合は発光センサ１４からの光線が反射物１７により反射されて受光センサ１５に到達し、受光センサ１５が反応する。この事から吸着物無しと判断できると同時に、アーム移動位置の確認もできる。さらに、このような装置では、上記の

形態と同様に、図１に示した従来技術に比べて無駄な上下移動が無いのでスループットが向上する。

【００２６】また、この形態でも、吸着ノズル穴から真空源又は負圧源までの真空ラインに正圧エアーを供給することで、ステージ１３の反射物１７の上面に吸着ノズルよりエアーを吹き付けて、反射物１７の清掃を容易に行なうことができる。

【００２７】但し、この形態においても、受光センサ１５が反射物１７による発光センサ１４の反射光を受けない時に吸着物有りと判断している為、アーム１２の停止位置が反射物１７に対してずれていた場合、ステージ１３上に吸着物１１が無いにもかかわらず、有るとセンサが誤判断する事がある。この場合、ノズル穴から真空源又は負圧源までの真空ラインに図１に示したような圧力センサを設置することにより、アーム位置ずれが判断できる。すなわち、アーム１２を下移動して吸引動作を行なった後、圧力センサで吸着物１１の有り無しをさらに確認することにより、アーム位置ずれが判断できる。

【００２８】また上記の形態と同様、圧力センサを使用せずに、吸着物の厚さ若しくは吸着物までの距離検出を行なえるセンサ等を使用しても、吸着物の有無とアーム位置ずれの確認ができる。

【００２９】以上のような２つの形態の他にも本発明は、図３又は図４に示した吸着搬送アーム１２の上部、即ちノズル穴の奥のセンサ部分（透過型センサの場合は受光センサのみ、反射型センサの場合は発光・受光センサの組）を、図５に示すように吸着搬送アーム１２から独立したセンサーユニット１９とし、センサーユニット１９と吸着搬送アーム１２のノズル穴とを光ファイバー１８で接続した装置であっても良い。

【００３０】また、上記のようなセンサーユニット１９を、図６に示すように、図３に示したステージ１３裏側の発光センサ１４、或いは図４に示したステージ１３上の反射物１７と対向するように固定した装置であっても良い。尚、この場合、吸着搬送アーム１２内をセンサの光線が通過できるように、ノズル穴の奥は吸着搬送アーム１２の上端まで貫通していると共に透過物１６で蓋されている。

【００３１】さらに、図３に示したような透過型センサ又は図４に示したような反射型センサを含む装置に替えて、図７に示すように、ステージ１３の、吸着物１１が置かれる場所に近接センサ２０を設置した装置であっても良い。

【００３２】加えて、吸着搬送アームに、相対する方向に在る対象物までの距離を測定する距離検出センサを配置することにより、吸着搬送アームの、吸着物までの下降距離を自己認識することもできる。そのため、吸着搬送アームの垂直移動装置に例えばサーボモータを用いれば、吸着物の高さが変わっても、吸着物を吸着するときの吸着搬送アームの下降ストロークを、その認識した下降距離に基づいて簡単に調整できる。この事は吸着搬送アームの垂直移動装置がエアシリンダーの場合に比べてメンテナンスにおいて効果的である。すなわち、垂直移動装置がエアシリンダーの場合は、吸着物の高さが変わると、エアシリンダーの取付け位置を調整したり吸着物のステージ高さを調整したりと調整に時間と手間がかかる。

【００３３】また、所定の場所の上方に基準位置から吸着搬送アームを水平移動させる際、所定の場所に対してアームの停止位置がずれる事がある。この事は次のような原因で起る。一般に、所定の場所の位置座標は基準位置を原点として予め求められている。そして吸着搬送アームの移動装置は、所定の場所の位置座標を参照して移動量を求め、その移動量だけ基準位置から吸着搬送アームを移動させている。ところが、搬送を長い間繰り返していると、搬送装置は劣化してアームの基準位置が狂ってくる。こうなると、所定の場所の位置座標を参照して求めた移動量だけ基準位置から吸着搬送アームを移動しても、所定の場所に対してアームの停止位置がずれてしまう。その結果、所定の場所に在る吸着物を吸着できなかったり、吸着できたとしても次の搬送場所に正確に搬送できなかったりする。

【００３４】本発明によれば、このようなアームの位置ずれも検知することができる。すなわち、所定の場所に吸着物が無い状態で、基準位置から所定の場所の上方に吸着搬送アームを水平移動させる。この時、発光センサからの光線を受光センサが受光しない場合、所定の場所に対して吸着搬送アームの位置がずれていると判断することができる。また、このように吸着搬送アームの停止位置がずれていると判断した後、発光センサからの光線を受光センサが受光するまで吸着搬送アームを任意の方向に水平移動させる。そして、受光センサが受光した時の、吸着搬送アームの移動装置により認識される位置座標に基づいて、吸着搬送アームを所定の場所の上方に移動させるときの位置座標を補正する。これにより、所定の場所に対する吸着搬送アームの位置ずれが修正され、所定の場所に在る吸着物を次の搬送場所に正確に搬送できる。しかも、吸着搬送アームのノズル内に位置ずれ検知部を持つ構造なので、例えばカメラを用いて位置ずれを検知する装置と比べて極めて小型なものになる。

【００３５】

【発明の効果】以上説明したように、本発明は、吸着物が置かれる場所の裏側もしくは吸着搬送アームのいずれか一方に発光素子を配置すると共に、前記吸着物が置かれる場所に発光素子の光を遮らない貫通穴を設けた。そして、前記発光素子が配置されていない、吸着物が置かれる場所の裏側もしくは吸着搬送アームに、前記発光素子からの光線を受光するための受光素子を配置した。あるいは、前記吸着物が置かれる場所の表面もしくは吸着搬送アームのいずれか一方に反射物を配置し、この反射

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物が配置されていない、前記吸着物が置かれる場所の表面もしくは吸着搬送アームに、発光素子及び、該発光素子の光線を前記反射物を介して受光するための受光素子を配置した。この事により、吸着物の有り無しの判断において、圧力センサのみによる従来技術のように無駄な上下移動をしないで済むので、スループットが向上する。また、垂直方向にて吸着物を検知できるので、センサの設置のために平面的なスペースを多く取らないで済み、センサの数も従来技術より削減できる。

【００３６】また、このような装置では、搬送吸着アームの位置ずれの確認もできる。そして、圧力センサを用いた従来技術と組み合せれば、より正確な吸着物の有無の検知ができる。さらには、吸着搬送アームの真空ラインに正圧エアーを供給し、吸着ノズルからエアーを噴出させることで、前記所定の場所に配される発光センサや反射物の清掃を行なうこともできる。

【図面の簡単な説明】

【図１】（ａ）及び（ｂ）は、圧力センサを用いた従来の吸着物検知装置の一例を示す構成図である。

【図２】透過型センサを用いた従来の吸着物検知装置の一例を示す構成図である。

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【図３】本発明の吸着物検知装置及び方法の一実施形態を表す模式的断面図である。

【図４】本発明の吸着物検知装置及び方法の他の実施形態を表す模式的断面図である。

【図５】本発明の吸着物検知装置及び方法の他の実施形態を表す模式的断面図である。

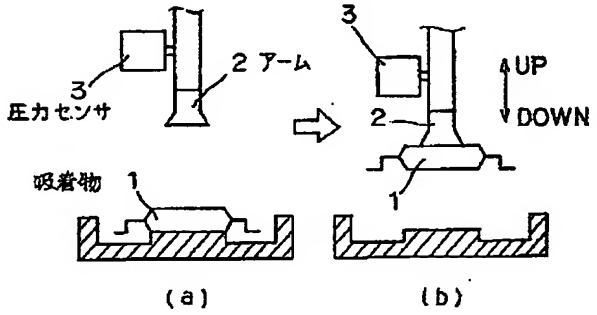
【図６】本発明の吸着物検知装置及び方法の他の実施形態を表す模式的断面図である。

【図７】本発明の吸着物検知装置及び方法の他の実施形態を表す模式的断面図である。

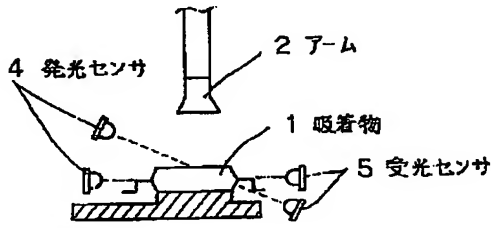
【符号の説明】

１１　吸着物
１２　吸着搬送アーム
１３　ステージ
１４　発光センサ
１５　受光センサ
１６　透過物
１７　反射物
１８　光ファイバ
１９　センサーユニット
２０　近接センサ

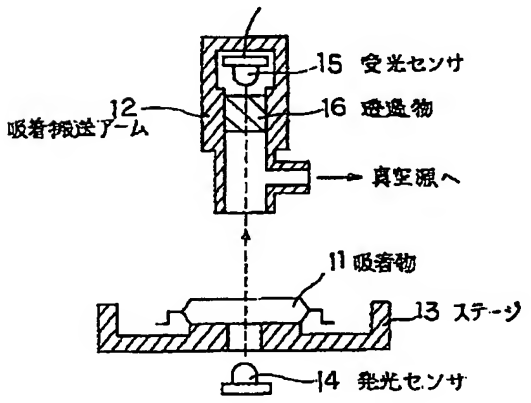
【図１】



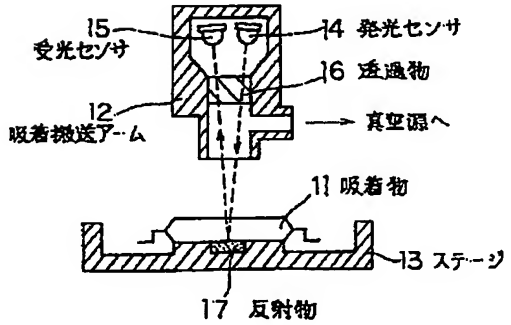
【図２】



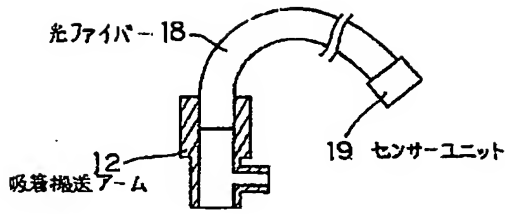
【図３】



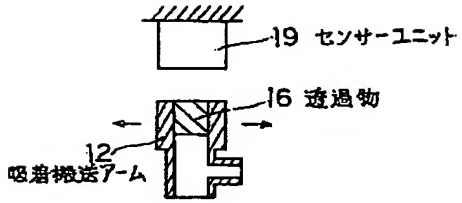
【図４】



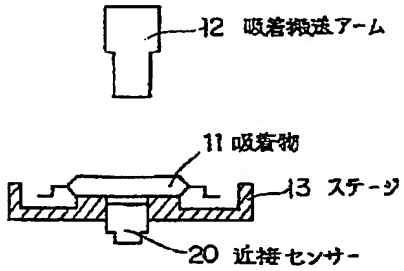
【図５】



【図６】



【図７】



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